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59. The system of claim 58, further comprising an angle displacement interferometer positioned to receive at least a portion of the measurement beam after it contacts the measurement object and generate the measurement signal.

60. The system of claim 58 further comprising:

a control circuit which during operation causes the positioning system to reorient the beam steering element in response to the change in the angular orientation of the measurement object.

61. The system of claim 60, wherein the control circuit reorients the beam steering element based on a control signal derived from the measurement beam.

62. The system of claim 61, further comprising an angle displacement interferometer positioned to receive at least a portion of the measurement beam after it contacts the measurement object and generate the control signal.

63. The system of claim 61 further comprising a detector having spatially resolved detector elements operative to measure the position and/or direction of at least a portion of the measurement beam after it contacts the measurement object.

64. The system of claim 63, wherein during operation the detector having the spatially resolved detector elements generates the control signal.

65. The system of claim 60, wherein during operation the control circuit causes the measurement beam to contact the measurement object at substantially normal incidence over a range of angular orientations of the measurement object.

66. The system of claim 61, wherein the measurement signal is derived from the reorientation of the beam steering element caused by the control circuit.

67. The system of claim 62, wherein the measurement signal is derived from the angle displacement interferometer.

68. The system of claim 58, wherein the measurement signal is derived from at least one interferometric signal produced by combining at least a portion of the measurement beam with a second beam after the measurement beam contacts the measurement object.

69. The system of claim 68, wherein the second beam is a second measurement beam that contacts the measurement object.

70. The system of claim 58, wherein the measurement signal is derived from at least two interferometric signals produced by combining at least two portions of the measurement beam with corresponding portions of another beam after the measurement beam contacts the measurement object.

71. The system of claim 58, wherein during operation the angle measurement system further calculates a change in optical path length to the measurement object based on interferometric information derived from the measurement beam and a reference beam.

72. The system of claim 58, wherein during operation the interferometer directs only one measurement beam to contact the measurement object.

73. The system of claim 72, wherein during operation the interferometer directs the measurement beam to make only a single pass to the measurement object.

74. The system of claim 58, wherein the beam steering element has two reflective faces and wherein during operation the interferometer directs the measurement beam to contact the first face before contacting the measurement object and directs the measurement beam to contact the second face after contacting the measurement object.

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75. The system of claim 74, wherein during operation the interferometer separates the measurement beam into at least two portions after contacting the measurement object but before contacting the second face.

76. The system of claim 74, wherein during operation the interferometer separates the measurement beam into at least two portions after contacting the second face.

77. An interferometry system comprising:

an interferometer which during operation directs a measurement beam to contact a measurement object, the interferometer comprising a beam steering assembly having a beam steering element positioned to contact and direct the measurement beam and an electronic positioning system to selectively orient the beam steering element within the interferometer; and

a control circuit which during operation causes the positioning system to reorient the beam steering element based on an interferometric control signal derived from the measurement beam indicative of a change in the angular orientation of the measurement object.

78. The interferometry system of claim 77, further comprising an angle displacement interferometer positioned to receive at least a portion of the measurement beam after it contacts the measurement object, wherein during operation the angle displacement interferometer generates the interferometric control signal.

79. The system of claim 77, wherein during operation the control circuit causes the measurement beam to contact the measurement object at substantially normal incidence over a range of angular orientations of the measurement object.

80. The system of claim 77, wherein during operation the interferometer directs only one measurement beam to contact the measurement object.

81. The system of claim 72, wherein during operation the interferometer directs the measurement beam to make only a single pass to the measurement object.

82. The system of claim 78, further comprising an angle measurement system which during operation calculates the change in angular orientation of the measurement object based on the interferometric control signal generated by the angle displacement interferometer.

83. An angle-measuring interferometry system comprising:

an interferometer which during operation receives an input beam, separates the input beam into a measurement beam and at least one other beam, and directs the measurement beam to contact a measurement object;

a beam steering assembly having a beam steering element positioned to direct the input beam into the interferometer and an electronic positioning system to selectively orient the beam steering element relative to the interferometer; and

an angle measurement system which during operation calculates a change in angular orientation of the measurement object based on a measurement signal derived from the measurement beam.

84. The system of claim 83 further comprising:

a control circuit which during operation causes the positioning system to reorient the beam steering element in response to the change in the angular orientation of the measurement object based on a control signal derived from the measurement beam.

85. The system of claim 84, further comprising an angle displacement interferometer positioned to receive at least a portion of the measurement beam after it contacts the measurement object, and wherein during operation the angle displacement interferometer generates the control signal.

86. The system of claim 84 further comprising a detector having spatially resolved detector elements operative to measure the position and/or direction of at least a portion of the measurement beam after it contacts the measurement object, and wherein during operation the detector generates the control signal.

87. The system of claim 84, wherein during operation the control circuit causes the measurement beam to contact the measurement object at substantially normal incidence over a range of angular orientations of the measurement object.

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88. The system of claim 84, wherein the measurement signal is derived from the reorientation of the beam steering element caused by the control circuit.

89. The system of claim 85, wherein the measurement signal is derived from the angle displacement interferometer.

90. The system of claim 84, wherein the measurement signal is derived from at least two interferometric signals produced by combining at least two portions of the measurement beam with corresponding portions of another beam after the measurement beam contacts the measurement object.

91. The system of claim 83, wherein during operation the angle measurement system further calculates a change in optical path length to the measurement object based on interferometric information derived from the measurement beam and a reference beam

92. The system of claim 83, wherein during operation the interferometer directs only one measurement beam to contact the measurement object.

93. The system of claim 92, wherein during operation the interferometer directs the measurement beam to make only a single pass to the measurement object.

94. The system of claim 83, wherein the beam steering element has two reflective faces and wherein during operation the input beam contacts the first face and at least a portion of measurement beam contacts the second face after contacting the measurement object.

95. The system of claim 94, wherein during operation the interferometer separates the measurement beam into at least two portions after contacting the measurement object but before contacting the second face.

96. The system of claim 95, wherein during operation the interferometer combines the two portions of the measurement beam with corresponding portions of a reference beam prior to contacting the second face.

97. The system of claim 83, further comprising an angle displacement interferometer positioned to receive at least a portion of the measurement beam after it contacts the measurement object and generate the measurement signal.

98. An interferometry system comprising:

an interferometer which during operation receives an input beam, separates the input beam into a measurement beam and at least one other beam, and directs the measurement beam to contact a measurement object;

a beam steering assembly having a beam steering element positioned to direct the input beam into the interferometer and an electronic positioning system to selectively orient the beam steering element relative to the interferometer; and

a control circuit which during operation causes the positioning system to reorient the beam steering element based on an interferometric control signal derived from the measurement beam indicative of a change in the angular orientation of the measurement object.

99. The interferometry system of claim 98, further comprising an angle displacement interferometer positioned to receive at least a portion of the measurement beam after it contacts the measurement object, wherein during operation the angle displacement interferometer generates the interferometric control signal.

100. The system of claim 59, 62, 78, 85, 97, or 98 wherein the angle displacement interferometer comprises an etalon.

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101. The system of claim 58 or 77, wherein the beam steering element is positioned to contact and direct the measurement beam before the measurement beam contacts the measurement object.

102. The system of claim 101, wherein the beam steering element is positioned to contact and direct the measurement beam before the measurement beam contacts the measurement object and after the measurement beam contacts the measurement object.

103. The system of claim 58 or 77, wherein the beam steering element is positioned to contact and direct the measurement beam only after the measurement beam contacts the measurement object.

104. An interferometry system comprising:

an interferometer which during operation directs a measurement beam to contact a measurement object, the interferometer comprising a beam steering assembly having a beam steering element positioned to contact and direct at least a portion of the measurement beam only after the measurement beam contacts the measurement object and an electronic positioning system to selectively orient the beam steering element within the interferometer; and

a control circuit which during operation causes the positioning system to reorient the beam steering element in response to a change in angular orientation of the measurement object.

105. A lithography system for use in fabricating integrated circuits on a wafer, the system comprising:

a stage for supporting the wafer;

an illumination system for imaging spatially patterned radiation onto the wafer;

a positioning system for adjusting the position of the stage relative to the imaged radiation; and

the interferometry system of claim 58, 77, 83, 98, or 104 for monitoring the position of the wafer relative to the imaged radiation.

106. A lithography system for use in fabricating integrated circuits on a wafer, the system comprising:

a stage for supporting the wafer; and

an illumination system including a radiation source, a mask, a positioning system, a lens assembly, and the interferometry system of claim 58, 77, 83, 98, or 104, wherein during operation the source directs radiation through the mask to produce spatially patterned radiation, the positioning system adjusts the position of the mask relative to the radiation from the source, the lens assembly images the spatially patterned radiation onto the wafer, and the interferometry system monitors the position of the mask relative to the radiation from the source.

107. A beam writing system for use in fabricating a lithography mask, the system comprising:

a source providing a write beam to pattern a substrate;

a stage supporting the substrate;

a beam directing assembly for delivering the write beam to the substrate;

a positioning system for positioning the stage and beam directing assembly relative one another; and

the inteferometry system of claim 58, 77, 83, 98, or 104 for monitoring the position of the stage relative to the beam directing assembly.